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**ASSESSING THE AWARENESS OF ANTIMICROBIAL RESISTANCE AMONG
PATIENTS AT THE HO TEACHING HOSPITAL, HO MUNICIPALITY, VOLTA
REGION, GHANA**

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JUNE, 2026

DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Ensign Global University, Kpong or any other educational institution, except where due acknowledgment is made in the thesis.

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Signature

Date

DEDICATION

This work is dedicated to my family.

ACKNOWLEDGEMENT

This work is dedicated firstly to God Almighty, in gratitude for the gift of life and strength to complete this work.

I wish to extend my deepest gratitude to my academic supervisor, from the Department of Public Health of the Ensign Global University for his steadfast support and encouragement throughout the duration of my study.

I am also profoundly grateful to the Ho Teaching Hospital and my Research Assistant and all my respondents, which significantly contributed to the accomplishment of this work.

ABSTRACT

Background: Antimicrobial resistance (AMR) is a major public health concern driven by inappropriate antibiotic use and limited patient awareness. This study assessed awareness of antimicrobial resistance among patients at Ho Teaching Hospital.

Methods: A descriptive cross-sectional study was conducted among 422 patients using a structured questionnaire. Data were analyzed using STATA version 18. Descriptive statistics summarized variables, while chi-square tests assessed associations between socio-demographic factors and AMR awareness ($p < 0.05$).

Results: Most respondents were young (35.5% aged 18–29 years) and female (55.0%). Overall, 64.0% had heard of AMR. Knowledge was moderate: 73.5% knew antibiotics treat bacterial infections, 69.9% understood AMR, and 71.1% recognized self-medication as a cause. However, only 28.4% correctly identified that antibiotics do not treat viral infections. Overall, 59.2% had good knowledge. Doctors (30.8%) and nurses (23.7%) were the main information sources, with doctors most trusted (42.7%). Knowledge was significantly associated with age, education, occupation, residence, and NHIS status ($p < 0.05$).

Conclusion: Although awareness exists, significant knowledge gaps remain, highlighting the need for strengthened public education and antimicrobial stewardship.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

Antimicrobial resistance (AMR) has emerged as a pressing global health concern, threatening the efficacy of treatments for a myriad of infectious diseases (Salam et al., 2023). The World Health Organization (WHO) identifies AMR as one of the top ten global public health threats facing humanity, attributing its rise to factors such as the misuse and overuse of antimicrobials, inadequate infection prevention, and insufficient public awareness (Aslam et al., 2024). A multinational survey by WHO revealed widespread misconceptions about antibiotic use, with a significant portion of respondents unaware that antibiotics are ineffective against viral infections like the common cold and flu (WHO, 2023).

In high-income countries, concerted efforts have been made to combat AMR through robust surveillance systems, stringent antibiotic stewardship programs, and public education campaigns. For instance, the United Kingdom has implemented the AWARe classification system to guide antibiotic use and has made certain resistant infections notifiable to enhance monitoring and response (Abdelsalam Elshenawy et al., 2023). Despite these measures, challenges persist, as evidenced by the rise in drug-resistant infections even in well-resourced healthcare settings (Steinecker, 2025).

Conversely, low- and middle-income countries (LMICs) face unique challenges in addressing AMR. In many LMICs, including those in sub-Saharan Africa, factors such as limited access to quality healthcare, over-the-counter availability of antibiotics without prescriptions, and lack of public awareness contribute to the acceleration of AMR (Kapatsa et al., 2025). A systematic review focusing on the WHO African Region highlighted that a significant proportion of the population

harbors misconceptions about antibiotic use, with many engaging in self-medication and not completing prescribed antibiotic courses (Cabral et al., 2024) .

Sub-Saharan Africa bears a disproportionate burden of AMR-related morbidity and mortality. According to UNESCO, the region has the highest mortality rate due to AMR, with over 700,000 deaths annually attributed to resistant infections (UNESCO, 2023). The situation is exacerbated by the high prevalence of infectious diseases such as HIV, tuberculosis, and malaria, which often require antimicrobial treatments, thereby increasing the risk of resistance development UNESCO, 2023).

In Ghana, AMR poses a significant threat to public health. Studies have documented high levels of resistance to commonly used antibiotics, with multidrug resistance rates reaching up to 78% for certain pathogens (Agyepong et al., 2018). The Ghanaian Ministry of Health, recognizing the gravity of the situation, launched the National Action Plan on Antimicrobial Resistance (2017–2021), aiming to improve awareness, surveillance, and stewardship practices (MoH, 2023). Despite these efforts, challenges persist, including inadequate implementation of surveillance systems and limited public awareness about AMR (Do et al., 2023).

At the local level, the Ho Teaching Hospital serves as a critical healthcare facility in the Volta Region of Ghana. Given its role in providing tertiary healthcare services, understanding the awareness levels of patients regarding AMR is crucial. Preliminary observations suggest that many patients may lack adequate knowledge about the appropriate use of antibiotics and the implications of resistance. Assessing patient awareness at this facility can provide valuable insights into the effectiveness of current educational initiatives and identify gaps that need to be addressed to curb the spread of AMR.

1.2 Problem Statement

Antimicrobial resistance (AMR) poses an escalating global threat to public health, with an estimated 4.95 million deaths associated with drug-resistant infections in 2019 alone, and nearly 1.27 million of these directly attributable to AMR (WHO, 2023). This burden disproportionately affects low- and middle-income countries, particularly in Sub-Saharan Africa, where fragile health systems, high rates of infectious disease, and unregulated antimicrobial use converge to intensify the threat (UNESCO, 2023). In developing countries, the inappropriate use of antibiotics including self-medication, incomplete dosing, and over-the-counter access without prescriptions is widespread and significantly contributes to the rise of resistant strains (Osei, Dankwah, & Agyekum, 2023).

In Ghana, AMR has emerged as a major health concern, with evidence showing increasing resistance to commonly used antibiotics such as ciprofloxacin, amoxicillin, and cotrimoxazole (Yevutsey et al., 2022). Although the Government of Ghana launched its National Action Plan on Antimicrobial Resistance (2017–2021) to combat the menace, challenges remain in public engagement and awareness (Ministry of Health, 2017). Recent studies have found that while awareness of antibiotics is relatively high, public knowledge about AMR, its causes, and its consequences is limited and fragmented (Gyamfi, Ofori-Asenso, & Annan, 2022). This knowledge gap fosters harmful practices such as the use of leftover antibiotics, pressure on healthcare providers for antibiotic prescriptions, and limited adherence to prescribed regimens.

The Ho Teaching Hospital, a key referral center in the Volta Region, serves a diverse patient population, yet little is known about the awareness levels of AMR among its patients. Without localized data, it is difficult to tailor public health interventions, education campaigns, and hospital-based antibiotic stewardship programs effectively. Understanding how patients perceive

AMR, what sources they rely on for health information, and the misconceptions they hold is vital for shaping behavior change strategies.

Therefore, this study seeks to assess the level of awareness and understanding of antimicrobial resistance among patients at Ho Teaching Hospital. The findings will provide empirical evidence to inform policy implementation, enhance patient education, and strengthen antimicrobial stewardship efforts in the hospital and beyond.

1.3 Objectives of the Study

1.3.1 General Objective

To assess the level of awareness and understanding of antimicrobial resistance (AMR) among patients at the Ho Teaching Hospital.

1.3.2 Specific Objectives

1. To evaluate patients' knowledge of the causes, consequences, and prevention of antimicrobial resistance.
2. To identify the sources of information patients rely on for antibiotic use and AMR-related knowledge.
3. To examine the relationship between patients' socio-demographic characteristics and their awareness of antimicrobial resistance.

1.4 Research Questions

1. What is the level of patients' knowledge regarding the causes, consequences, and prevention of antimicrobial resistance at Ho Teaching Hospital?
2. What are the main sources of information from which patients obtain knowledge about antibiotic use and antimicrobial resistance?

3. How do socio-demographic factors (such as age, education, gender, and occupation) influence patients' awareness of antimicrobial resistance?

1.5 Justification of the Study

Antimicrobial resistance (AMR) poses a significant threat to global health, with its burden especially pronounced in low- and middle-income countries where regulatory systems and public health education may be weak (WHO, 2022). In Ghana, the misuse and overuse of antibiotics remain key drivers of resistance, yet public awareness and understanding of AMR remain limited (MoH, 2021). Ho Teaching Hospital, being a major referral facility in the Volta Region, serves a diverse patient population whose behaviors and knowledge concerning antibiotic use could either exacerbate or help curb the spread of resistance. Despite growing national and global efforts to contain AMR, there is a paucity of local-level data on how well patients understand this issue.

This study is justified as it seeks to bridge the knowledge gap by providing empirical data on patients' awareness of AMR at the Ho Teaching Hospital. Understanding patients' knowledge levels, information sources, and misconceptions can inform targeted health education strategies and stewardship programs. Furthermore, the findings can support the hospital and regional health authorities in tailoring interventions that align with the realities of the local population. In doing so, the study contributes to Ghana's broader antimicrobial resistance containment strategy and aligns with Sustainable Development Goal 3, which aims to ensure healthy lives and promote wellbeing for all.

1.6 Scope of the Study

This study focuses on assessing the awareness of antimicrobial resistance (AMR) among patients attending Ho Teaching Hospital in the Volta Region of Ghana. It specifically targets adult patients

from various outpatient and inpatient departments to understand their knowledge, attitudes, and practices related to antibiotic use and resistance. The study is limited to data collection within the hospital setting and does not include healthcare providers or external pharmacies. It will explore patients' sources of information on antibiotics, their understanding of correct usage, and perceptions of resistance. The findings will be contextualized within the hospital environment and may not be generalizable to the wider Ghanaian population.

1.7 Limitations of the Study

This study is subject to several limitations. First, the findings may not be generalizable beyond the Ho Teaching Hospital, as the study focuses solely on patients within this facility and may not reflect the awareness levels in other regions or healthcare settings. Second, the study relies on self-reported data, which may be affected by recall bias or social desirability bias, leading participants to overstate their knowledge or provide answers they perceive as acceptable. Third, the cross-sectional design captures awareness at a single point in time and does not account for changes in knowledge or behavior over time. Lastly, language barriers and literacy levels among some respondents may affect their ability to fully comprehend the questionnaire, potentially impacting the accuracy of responses.

1.8 Organization of the Study

This study is organized into five main chapters.

Chapter One presents the introduction, which includes the background of the study, problem statement, research objectives, research questions, justification, scope, and limitations of the study.

Chapter Two reviews existing literature related to antimicrobial resistance (AMR), highlighting global, regional, and local perspectives on awareness and knowledge among patients.

Chapter Three focuses on the research methodology, outlining the study design, target population, sampling techniques, data collection methods, and data analysis procedures.

Chapter Four presents the results and findings of the study, followed by an in-depth analysis and interpretation of the data collected.

Chapter Five concludes the study with a summary of the findings, conclusions drawn, recommendations for policy and practice, and suggestions for further research.

1.9 Conceptual Framework

The conceptual framework is based on the Health Belief Model (HBM), and adapted from Lin et al., (2020) which is widely used in public health to understand health-related behaviors and perceptions. This framework is ideal for exploring how patients' awareness, beliefs, and perceptions influence their behaviors related to antimicrobial use and their understanding of antimicrobial resistance (AMR).

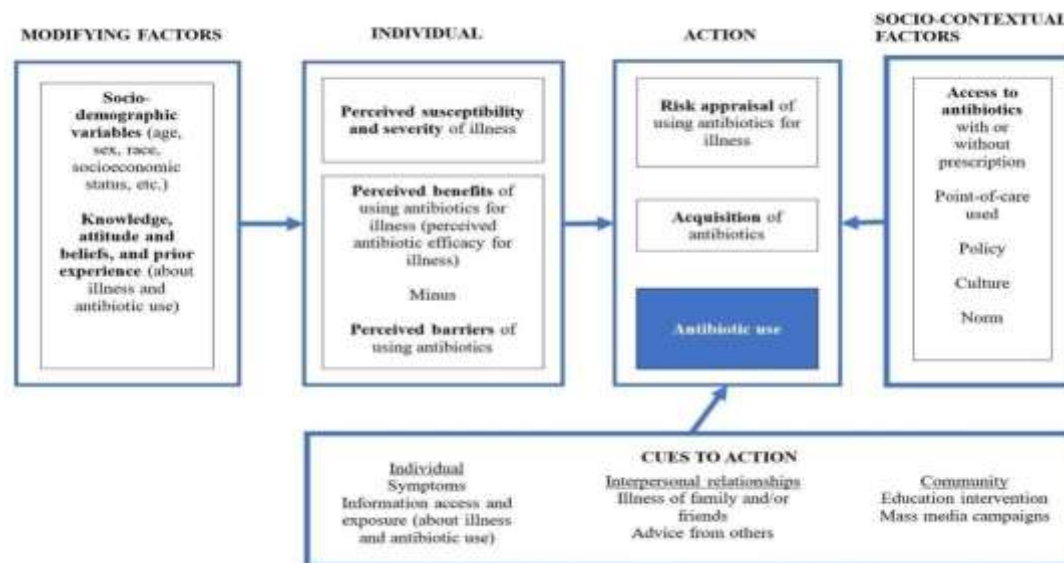


Figure 1: Conceptual Framework

Source: Adapted from (Lin et al., 2020)

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview of Antimicrobial Resistance (AMR)

Antimicrobial resistance (AMR) is widely recognized as a major global health threat, undermining the effectiveness of antibiotics and other antimicrobial agents used to treat infectious diseases. AMR occurs when microorganisms such as bacteria, viruses, fungi, and parasites evolve mechanisms that render antimicrobial drugs ineffective (Salam et al., 2023). The increasing prevalence of resistant pathogens has led to treatment failures, prolonged illness, higher healthcare costs, and increased mortality worldwide.

Globally, AMR has been associated with millions of deaths, with the burden disproportionately affecting low- and middle-income countries. The rise of AMR is largely driven by inappropriate antibiotic use, including overuse, misuse, and self-medication, as well as poor infection prevention practices (Aslam et al., 2024). Evidence indicates that misuse of antibiotics accelerates the development of resistant strains, thereby reducing the effectiveness of standard treatments (Salam et al., 2023).

In the WHO African Region, AMR awareness remains relatively low, and many individuals do not fully understand its causes and consequences. A systematic review revealed that a large proportion of patients are unaware that improper antimicrobial use contributes to resistance and that resistant infections can lead to longer hospital stays and increased healthcare costs (Fuller et al., 2023) . This highlights the need for improved public awareness and education to combat the growing threat of AMR.

2.2 Knowledge of Antibiotics and Antimicrobial Resistance

Knowledge of antibiotics and antimicrobial resistance (AMR) plays a critical role in shaping individuals' health-seeking behavior, treatment adherence, and antibiotic use practices. Adequate knowledge enables patients to make informed decisions, reduces inappropriate antibiotic use, and ultimately contributes to efforts aimed at controlling antimicrobial resistance. However, evidence from both global and sub-Saharan African contexts indicates that while general awareness of antibiotics is relatively common, a comprehensive understanding of AMR remains limited.

Studies conducted across sub-Saharan Africa consistently reveal disparities between knowledge of antibiotics and awareness of antimicrobial resistance. For instance, a study in Nigeria reported that although 73.1% of respondents demonstrated good knowledge of antibiotics, more than half (57.8%) had poor awareness of AMR, highlighting a significant knowledge gap (Salam et al., 2023). Similarly, Osei et al. (2023) found that while a considerable proportion of respondents had heard about antibiotic resistance, only a minority could accurately explain its causes, consequences, and prevention strategies. This disconnect suggests that mere exposure to the concept of AMR does not necessarily translate into meaningful understanding.

In Ghana, similar patterns have been observed. Studies indicate that although many individuals are aware that misuse of antibiotics can contribute to resistance, misconceptions about appropriate antibiotic use persist. Kapatsa et al. (2025) reported that over 80% of respondents recognized that improper antibiotic use leads to resistance; however, a substantial proportion still believed that antibiotics are effective against viral infections such as the common cold and influenza. These misconceptions are critical because they directly influence inappropriate health behaviors, including unnecessary demand for antibiotics and self-medication.

Misunderstanding the nature of antibiotics and their appropriate use remains a major contributor to AMR. One of the most common misconceptions is the belief that antibiotics can treat viral infections, which has been widely documented across different populations (Osei et al., 2023; Fuller et al., 2023). This misconception often leads to the misuse of antibiotics for conditions such as colds and flu, where they offer no clinical benefit. Another prevalent misunderstanding is the practice of discontinuing antibiotic treatment once symptoms improve, rather than completing the full prescribed course. This behavior promotes the survival of partially resistant bacteria, thereby accelerating the development of resistance (Salam et al., 2023).

In addition to misconceptions about use, knowledge of the broader consequences of antimicrobial resistance is often inadequate. Many individuals are unaware that AMR can lead to prolonged illness, increased healthcare costs, treatment failure, and higher mortality rates. Fuller et al. (2023) found that a significant proportion of respondents lacked awareness of the long-term implications of antibiotic resistance, including its impact on surgical procedures and the treatment of chronic diseases. This limited understanding reduces the perceived seriousness of AMR and weakens motivation to adopt preventive behaviors.

Preventive knowledge is another critical component of AMR awareness. Effective prevention strategies include proper hygiene practices, vaccination, adherence to prescribed antibiotic regimens, and avoidance of self-medication. However, studies indicate that knowledge of these preventive measures remains suboptimal in many settings. For example, Fuller et al. (2023) reported that although some respondents were aware of hygiene practices such as handwashing, fewer recognized the role of vaccination and responsible antibiotic use in preventing resistance. This suggests that health education efforts have not fully addressed the multifaceted nature of AMR prevention.

Furthermore, knowledge levels are often influenced by socio-demographic factors such as education, income, and access to healthcare. Individuals with higher levels of education and greater exposure to healthcare services tend to have better understanding of antibiotics and AMR (Kapatsa et al., 2025). Conversely, those in rural or resource-limited settings often exhibit lower levels of knowledge due to limited access to reliable health information. This disparity underscores the need for targeted educational interventions that address the specific needs of different population groups.

Another important dimension of knowledge is the role of cultural beliefs and social norms in shaping perceptions of antibiotic use. In some communities, antibiotics are perceived as “strong” or “quick-fix” medicines, leading to their overuse even when not medically indicated. Such beliefs can reinforce inappropriate practices and hinder efforts to promote rational antibiotic use (Osei et al., 2023). Addressing these cultural perceptions requires context-specific health education strategies that are culturally sensitive and community-driven.

Despite these challenges, there is evidence that improved knowledge can lead to better antibiotic use practices. Public health interventions, including awareness campaigns and patient education programs, have been shown to increase knowledge and reduce inappropriate antibiotic use. However, the effectiveness of these interventions depends on their ability to address specific knowledge gaps and misconceptions within the target population (Fuller et al., 2023).

2.3 Causes and Prevention of Antimicrobial Resistance

The causes of antimicrobial resistance (AMR) are multifactorial and operate at individual, community, and systemic levels. The primary drivers include the misuse and overuse of antibiotics in human medicine, agriculture, and animal husbandry. In clinical settings, inappropriate prescribing practices—such as prescribing antibiotics for non-bacterial infections, incorrect

dosing, and unnecessary broad-spectrum antibiotic use—significantly contribute to the development of resistance (Aslam et al., 2024). In addition, self-medication, incomplete dosage, and the use of antibiotics without proper medical supervision remain widespread behaviors that accelerate the emergence of resistant microorganisms.

In many low- and middle-income countries, the ease of access to antibiotics without prescription is a major contributing factor. Weak regulatory frameworks and inadequate enforcement of pharmaceutical policies allow individuals to purchase antibiotics freely from pharmacies and informal drug vendors. Osei et al. (2023) reported that a substantial proportion of individuals in

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developing settings obtain antibiotics without prescriptions and often lack proper guidance on their use. In Ghana, Yevutsey et al. (2022) found that more than half of respondents had purchased antibiotics without prescription, highlighting the prevalence of self-medication even among relatively informed populations.

Beyond human medicine, the use of antibiotics in agriculture and animal production is another significant driver of AMR. Antibiotics are frequently used for growth promotion and disease prevention in livestock, which can lead to the development of resistant bacteria that are transmitted to humans through the food chain and the environment. This interconnectedness between human, animal, and environmental health underscores the importance of a “One Health” approach in addressing AMR (Aslam et al., 2024).

Poor infection prevention and control practices further exacerbate the spread of resistant organisms. Inadequate sanitation, limited access to clean water, and overcrowded living conditions facilitate the transmission of infections, thereby increasing the demand for antibiotics. In

healthcare settings, insufficient adherence to infection prevention protocols such as hand hygiene and sterilization—can lead to the spread of resistant pathogens among patients. Kapatsa et al. (2025) emphasize that in sub-Saharan Africa, weak health systems and inadequate infrastructure significantly contribute to the persistence and spread of AMR.

Another critical factor is the limited availability of diagnostic facilities, which often results in empirical treatment. In many settings, healthcare providers prescribe antibiotics based on clinical judgment rather than laboratory confirmation of bacterial infection. While this approach may be necessary in resource-limited environments, it increases the likelihood of inappropriate antibiotic use and contributes to resistance development (Do et al., 2023). Additionally, patient demand for antibiotics and pressure on healthcare providers to prescribe them—even when not clinically indicated further complicate efforts to promote rational use.

Socio-cultural factors also play a role in driving antimicrobial resistance. In some communities, antibiotics are perceived as powerful and essential medicines for treating a wide range of illnesses, leading to their overuse. Misconceptions about illness and treatment, combined with limited health literacy, contribute to inappropriate practices such as sharing medications and using leftover antibiotics (Gyamfi et al., 2022). Economic factors, including the cost of healthcare services, may also encourage individuals to self-medicate rather than seek professional medical advice.

Preventing antimicrobial resistance requires a comprehensive and multi-sectoral approach. One of the most effective strategies is promoting rational antibiotic use through public education and awareness campaigns. Educating individuals about the appropriate use of antibiotics, the importance of completing prescribed courses, and the risks associated with misuse can significantly reduce inappropriate practices. Fuller et al. (2023) highlight that increased public awareness is associated with improved antibiotic use behaviors and reduced self-medication.

Infection prevention and control measures are equally critical in reducing the need for antibiotics and limiting the spread of resistant organisms. These measures include proper hand hygiene, sanitation, vaccination, and safe food handling practices. Vaccination, in particular, plays a vital role in preventing infections and reducing the reliance on antibiotics, thereby lowering the risk of resistance development (World Health Organization, 2023).

Antimicrobial stewardship programs (ASPs) have been identified as key interventions in addressing AMR. These programs aim to optimize antibiotic use by ensuring that patients receive the right antibiotic, at the right dose, and for the right duration. Evidence shows that ASPs can reduce inappropriate prescribing, improve patient outcomes, and decrease healthcare costs (Do et al., 2023). However, the implementation of these programs remains limited in many low-resource settings due to challenges such as inadequate funding, lack of trained personnel, and weak institutional support.

Strengthening regulatory frameworks is another important preventive strategy. Governments must enforce policies that restrict over-the-counter sales of antibiotics and ensure that these medications are dispensed only with valid prescriptions. In Ghana, the National Action Plan on Antimicrobial Resistance emphasizes the need for stronger regulation and surveillance systems to monitor antibiotic use and resistance patterns (MoH, 2017).

Furthermore, improving access to healthcare services and diagnostic facilities can reduce reliance on empirical treatment and promote appropriate antibiotic use. Investments in laboratory infrastructure and training of healthcare professionals are essential to support evidence-based prescribing practices. Community engagement and involvement of local leaders can also enhance the effectiveness of interventions by promoting behavior change at the grassroots level.

2.4 Antibiotic Use Behaviour and Practices

Antibiotic use behaviour remains a critical determinant in the emergence and spread of antimicrobial resistance (AMR), particularly in low- and middle-income countries where regulatory systems are often weak. Empirical evidence consistently demonstrates that inappropriate antibiotic practices—such as self-medication, non-adherence to prescribed regimens, sharing medications, and use of leftover drugs are highly prevalent and significantly contribute to resistance development.

A cross-sectional study conducted in Ethiopia reported that approximately 47% of respondents practiced self-medication with antibiotics, with many individuals obtaining drugs without prescriptions and using them based on prior experience or advice from non-professionals (Erku et al., 2021). Similarly, research in Tanzania revealed that more than 60% of community members admitted to discontinuing antibiotic treatment once symptoms subsided, rather than completing the prescribed course, thereby increasing the risk of treatment failure and resistance (Sangeda et al., 2022). These findings align with broader evidence from sub-Saharan Africa, where inappropriate antibiotic consumption patterns remain widespread.

In Ghana, antibiotic misuse is also well documented across different population groups. A study among university students found that 70% had engaged in self-medication with antibiotics, citing reasons such as previous successful use, cost-saving considerations, and long waiting times at healthcare facilities (Donkor et al., 2012). Additionally, another study reported that antibiotics are frequently obtained from community pharmacies without prescriptions, reflecting gaps in regulatory enforcement and public health education (Afari-Asiedu et al., 2018). These practices are not limited to urban settings; rural populations often rely on informal drug vendors or leftover medications due to limited access to formal healthcare services.

Behavioural drivers of antibiotic misuse are multifactorial. Socioeconomic constraints, including poverty and lack of health insurance, often push individuals toward self-medication as a cost-effective alternative to formal healthcare. Cultural beliefs and past experiences with illness also influence decision-making, with many individuals perceiving antibiotics as “quick cures” for a wide range of ailments, including viral infections (Ocan et al., 2015). Furthermore, weak enforcement of pharmaceutical regulations allows for the over-the-counter sale of antibiotics, thereby facilitating misuse.

The consequences of these practices are substantial. Inappropriate antibiotic use accelerates the development of resistant pathogens, reduces the effectiveness of existing treatments, and increases the burden on healthcare systems. Clinically, this leads to prolonged illness, higher healthcare costs, increased hospitalization rates, and elevated mortality risk (Laxminarayan et al., 2013). Additionally, misuse exposes individuals to unnecessary adverse drug reactions and disrupts normal microbiota, further complicating treatment outcomes.

Addressing inappropriate antibiotic use requires a multifaceted approach. Public health education campaigns aimed at improving knowledge and attitudes toward antibiotic use have been shown to influence behaviour positively. For example, community-based interventions in Kenya demonstrated improved adherence to prescribed antibiotic regimens following targeted educational programs (McNulty et al., 2019). Strengthening regulatory frameworks to control the sale of antibiotics and enforcing prescription-only policies are also essential components of AMR containment strategies. Moreover, improving access to affordable and quality healthcare services can reduce reliance on informal sources of antibiotics.

2.5 Sources of Information on Antibiotics and AMR

Sources of information play a crucial role in shaping individuals' knowledge and attitudes toward antibiotics and AMR. Healthcare professionals, including doctors, nurses, and pharmacists, are consistently identified as the most trusted sources of information.

However, studies show that many individuals rely on informal sources such as family members, friends, and media platforms for information on antibiotic use. In some cases, misinformation from these sources contributes to inappropriate practices and misconceptions about antibiotics.

In sub-Saharan Africa, limited access to reliable health information and low health literacy levels further complicate the situation. A systematic review found that public awareness campaigns and health education initiatives are often inadequate, leading to gaps in knowledge and understanding of AMR (Fuller et al., 2023).

Mass media, including radio and television, has been identified as an effective channel for disseminating health information, particularly in rural areas. Social media and the internet are also increasingly important sources of information, especially among younger populations.

Despite the availability of multiple information sources, the frequency and quality of AMR-related information remain limited. This highlights the need for structured and consistent health communication strategies to improve public awareness.

2.6 Socio-Demographic Factors Influencing AMR Awareness

Socio-demographic characteristics such as age, education, occupation, and place of residence significantly influence awareness and knowledge of antimicrobial resistance.

Education level has been consistently identified as a key determinant of AMR awareness. Individuals with higher levels of education are more likely to have better knowledge of antibiotics

and resistance (Fuller et al., 2023). Similarly, studies in Zimbabwe found that education and socioeconomic status strongly predict AMR awareness and safe practices (Kapatsa et al., 2025).

Place of residence also plays an important role, with urban residents generally demonstrating higher levels of awareness compared to rural populations. This is attributed to better access to healthcare services, information, and education in urban areas (Osei et al., 2023).

Gender differences in AMR awareness are less consistent, with some studies reporting no significant association between sex and knowledge levels (Osei et al., 2023).

Additionally, frequency of healthcare visits has been associated with better awareness, as individuals who interact more frequently with healthcare providers are more likely to receive information about antibiotics and AMR.

2.7 Summary of Literature Review

The reviewed literature indicates that antimicrobial resistance is a significant global and regional health challenge driven largely by inappropriate antibiotic use and limited public awareness. While basic knowledge of antibiotics is relatively common, comprehensive understanding of AMR remains inadequate, particularly in sub-Saharan Africa.

Inappropriate antibiotic use practices such as self-medication and incomplete treatment are widespread and contribute significantly to the development of resistance. Healthcare professionals are the most trusted sources of information, but reliance on informal sources and inconsistent health education limit effective knowledge dissemination.

Socio-demographic factors, particularly education and residence, play a crucial role in shaping AMR awareness. These findings underscore the need for targeted interventions, including public

education campaigns, improved health communication, and strengthened antimicrobial stewardship programs.

This study builds on existing literature by providing context-specific evidence on AMR awareness among patients at Ho Teaching Hospital, thereby contributing to efforts aimed at improving antibiotic use practices and combating antimicrobial resistance in Ghana.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter outlines the methodological approach used to assess patients' awareness of antimicrobial resistance (AMR) at the Ho Teaching Hospital. It details the research design, study area, population, sampling techniques, sample size determination, data collection instruments, procedures, and methods for data analysis. The methodology is structured to ensure the reliability, validity, and ethical integrity of the research process. By employing a quantitative approach, the study aims to gather measurable data on patients' knowledge, attitudes, and practices related to AMR, and to explore the influence of socio-demographic factors on their awareness levels.

3.2 Study Area: Ho Teaching Hospital

Ho Teaching Hospital (HTH) is located in Ho, the capital of the Volta Region of Ghana. It serves as the main tertiary healthcare facility in the region and provides specialized medical services to residents of Ho Municipality and surrounding districts. Established in 1998 and later upgraded to a teaching hospital in 2019, HTH is affiliated with the University of Health and Allied Sciences (UHAS), making it a key center for clinical training, research, and healthcare delivery.

The hospital has a bed capacity of over 300 and offers a wide range of services, including internal medicine, surgery, pediatrics, obstetrics and gynecology, pharmacy, diagnostic services, and public health. Its strategic location in the heart of Ho makes it accessible to patients from both urban and rural communities. As a referral center, it receives patients from other health facilities in the Volta and Oti Regions, as well as some parts of Eastern Ghana.

Like many tertiary hospitals in Ghana, it manages a significant burden of infectious diseases such as respiratory tract infections, urinary tract infections, skin and wound infections, and gastrointestinal infections, which frequently require antibiotic treatment. Due to the high

prevalence of these bacterial infections, antibiotics are among the most commonly prescribed and dispensed medicines within the hospital and surrounding community pharmacies.

However, the frequent and often inappropriate use of antibiotics, including self-medication, incomplete courses, and misuse of leftover antibiotics, contributes to the growing problem of antimicrobial resistance (AMR) in the area. While prescribers and pharmacists play a key role in rational use, patient awareness and behaviour regarding antimicrobial use remain critical to reducing the misuse that drives resistance. Understanding patients' level of awareness of AMR at Ho Teaching Hospital is therefore essential for guiding targeted education and stewardship interventions to help curb this public health threat.

Ho Municipality itself is a culturally diverse area with a mix of urban and peri-urban populations. The residents engage in various occupations including trading, civil service, teaching, farming, and artisanal work. Literacy levels are relatively high compared to some rural parts of Ghana, but access to reliable health information still varies significantly among different socio-economic groups.

The selection of Ho Teaching Hospital as the study area is appropriate because of its role as a leading healthcare provider in the region, its high patient turnover, and its potential to reflect a wide demographic of healthcare seekers. This setting provides a valuable context for assessing patients' awareness and understanding of antimicrobial resistance, given the hospital's exposure to both clinical treatment practices and public health outreach initiatives.

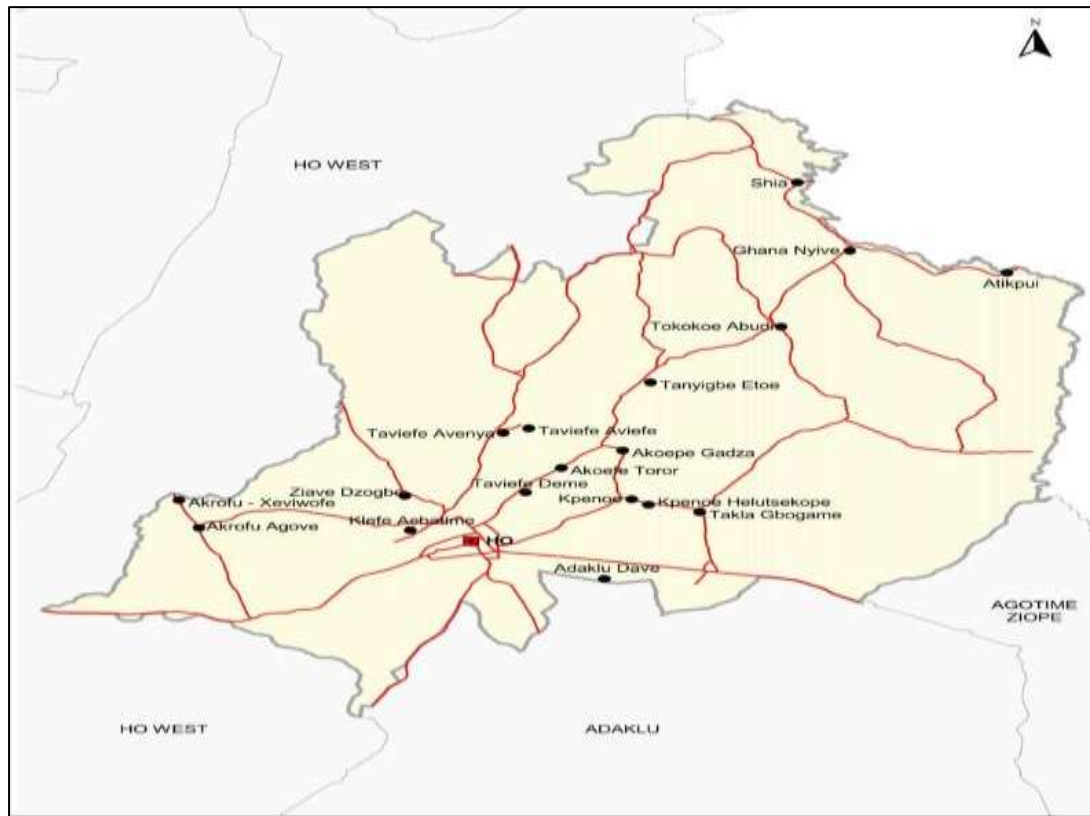


Figure 2: Map of Ho Municipality in the Volta Region of Ghana

3.3 Study Design

This study adopted a quantitative research approach and employs a descriptive cross-sectional design. A cross-sectional design is suitable for obtaining data at a single point in time, enabling the researcher to describe the current status of patients' knowledge, attitudes, and practices regarding AMR without manipulating any variables. This design allows for the identification of associations between socio-demographic characteristics and AMR awareness levels. It is cost-effective, time-efficient, and appropriate for informing public health interventions based on observed gaps in knowledge and behavior among the study population.

3.3 Inclusion and Exclusion Criteria

3.3.1 Inclusion Criteria

1. Only adult patients were included to ensure that participants are capable of giving informed consent and are likely to have independent knowledge and experiences regarding antimicrobial use.
2. The study focused on individuals accessing services from the hospital during the period of data collection.
3. Participation is entirely voluntary, and only those who agree to partake in the study will be included.

3.3.2 Exclusion Criteria

1. Those who are below 18 years will be excluded to avoid ethical concerns and issues related to consent.
2. Those who may not engage meaningfully due to illness or communication barriers will be excluded to maintain data quality.
3. Individuals who will choose not to participate or withdraw consent at any stage will be excluded from the study.

3.4 Study Population

The study population consist of patients receiving medical care at the Ho Teaching Hospital in the Volta Region of Ghana. These individuals represent a diverse demographic in terms of age, gender, education level, and socio-economic status. The target population specifically include adult patients (18 years and above) attending outpatient departments and in-patient wards such as the male and female wards during the period of data collection.

This population was chosen because they are likely to have recent or ongoing interactions with antibiotics, making them suitable for assessing awareness of antimicrobial resistance (AMR). Given the hospital's role as a referral center in the region, the patient population provided a representative sample for understanding AMR awareness within a broader community context. The study focused on capturing variations in knowledge, attitudes, and practices across different socio-demographic groups within this patient population.

3.5 Sampling Technique

The study employed a stratified random sampling technique to ensure adequate representation of different categories of patients at the Ho Teaching Hospital. The hospital was stratified into various departments such as the Outpatient Department (OPD), Medical Ward, Surgical Ward, and other relevant units where patients are commonly prescribed antibiotics. Within each stratum, a proportionate number of participants were randomly selected based on the estimated patient load in that department.

This method was chosen to reduce selection bias and to enhance the generalizability of the findings across the hospital population. Stratification ensured that diverse patient experiences and knowledge levels were captured, especially regarding the use of antibiotics and awareness of antimicrobial resistance (AMR). Only patients who met the inclusion criteria and consented to participate were selected. This sampling approach helped to achieve a balanced sample reflective of the broader patient population at the Ho Teaching Hospital.

3.6 Sample size Determination

The sample size for this study was determined using the Cochran formula (1977), which is commonly applied in health research when the population is large or unknown:

$$n = \frac{Z^2 \times pq}{d_2^2}$$

Where:

n = required sample size

Z = Z-score for the desired confidence level (1.96 for 95% confidence) p = estimated proportion of the population with adequate knowledge of AMR (since no prior data exists, 0.5 is used for maximum variability) d = margin of error (0.05)

Therefore,

$$n = \frac{(1.96)^2 \times (0.5 \times 0.5)}{(0.05)^2} \cong 384.16$$

Therefore, the minimum required sample size is approximately 384 respondents.

To account for possible non-response or incomplete questionnaires, a 10% contingency will be added:

$$n_{\text{adjusted}} = 384 + (0.10 \times 384) = 384 + 38.4 = 422.4$$

The final estimated sample size will therefore be approximately 422 respondents.

This sample size will ensure that the study results are statistically valid, reliable, and representative of adult patients attending Ho Teaching Hospital during the study period.

3.7 Data Collection Instrument and Approach

The primary data collection instrument for this study is a structured questionnaire, specifically designed to assess patients' awareness, knowledge, and perceptions regarding antimicrobial resistance (AMR). The questionnaire includes both closed-ended and Likert-scale questions that cover demographic characteristics, knowledge of AMR causes, consequences, and prevention, as well as sources of antibiotic-related information and individual antibiotic use behaviors.

The development of the questionnaire was guided by constructs from the Health Belief Model (HBM) and the Knowledge, Attitudes, and Practices (KAP) framework, ensuring that it captures

relevant theoretical dimensions such as perceived susceptibility, severity, and behavioral intentions toward antibiotic use.

Data collection was conducted using a face-to-face approach by trained research assistants at the Outpatient Department (OPD) of Ho Teaching Hospital. This method allows for clarification of questions, encourages participation, and minimizes incomplete responses. All participants will be provided with informed consent forms before engaging in the study. To ensure reliability, the questionnaire was pre-tested among a small group of similar patients in a nearby facility not included in the main study.

3.8 Data Analysis

Data collected from the completed questionnaires was coded, entered, and analyzed using STATA version 18.0. Descriptive statistics such as frequencies, percentages, means, and standard deviations was used to summarize demographic characteristics and responses related to knowledge, attitudes, and practices concerning antimicrobial resistance.

To assess relationships between variables, inferential statistics will be employed. Chi-square tests was used to examine associations between socio-demographic characteristics (e.g., age, gender, education level) and levels of AMR awareness. Additionally, binary logistic regression may be used to identify predictors of good AMR knowledge, adjusting for potential confounders. For Likert-scale questions assessing attitudes and practices, composite scores was computed, and internal consistency was evaluated using Cronbach's alpha. The significance level for all inferential tests will be set at $p < 0.05$.

3.9 Ethical Consideration

Before the commencement of data collection, ethical approval was sought from the Ensign Global University. The purpose of the study was explained to respondents. They were made aware that

there are no benefits or losses for participating in the study or not. Informed consent was sought from participants either in writing. Participants were informed that they are free to leave the study at any moment devoid of negative consequences. Information gathered was kept confidential and anonymity was guaranteed Coding mechanisms were devised to guarantee that no one other than the researcher is aware of the source of the data.

CHAPTER FOUR

4.0 RESULTS

4.1 Introduction

This chapter presents the findings of the study. The results are organized in line with the study objectives and are presented using tables to facilitate clarity and interpretation.

The chapter begins with the socio-demographic characteristics of respondents, followed by an assessment of their knowledge of antibiotics and antimicrobial resistance, including causes, consequences, and prevention. It further examines respondents' antibiotic use behaviours and identifies the main sources of information regarding antibiotic use and AMR. Finally, the chapter explores the relationship between selected socio-demographic variables and respondents' level of awareness of antimicrobial resistance using appropriate statistical tests.

Descriptive statistics such as frequencies and percentages are used to summarize the data, while inferential statistics, particularly the chi-square test, are employed to determine associations between variables. All results are presented based on a total sample size of 422 respondents.

4.2 Socio-demographic characteristics of respondents

Table 1: Socio-demographic characteristics of respondents

		Frequency (n=422)	Percentage (%)	Variable
Age	Category			
	18–29	150	35.5	
	30–39	110	26.1	
	40–49	70	16.6	
	50–59	55	13	
	60+	37	8.8	
Sex	Male	190	45	
	Female	232	55	

Education	None	40	9.5
	Primary	70	16.6
	JHS	100	23.7
	SHS	125	29.6
	Tertiary	87	20.6
Occupation	Farmer	60	14.2
	Trader	120	28.4
	Civil servant	85	20.1
	Student	95	22.5
	Unemployed	62	14.7
Marital Status	Single	170	40.3
	Married	200	47.4
	Divorced	25	5.9
	Widowed	27	6.4
Residence	Urban	180	42.7
	Peri-urban	140	33.2
	Rural	102	24.2
NHIS Status	Yes	320	75.8
	<u>No</u>	<u>102</u>	<u>24.2</u>

Source: Field Survey, 2025

The socio-demographic characteristics of the respondents show that the study population was largely young and economically active. The majority of respondents were aged 18–29 years (35.5%), followed by those aged 30–39 years (26.1%), indicating that most participants were within the youthful age groups.

In terms of sex, females constituted a slightly higher proportion (55.0%) compared to males (45.0%), suggesting a modest female predominance in the study.

Regarding educational attainment, most respondents had at least basic education, with the highest proportion having Senior High School (29.6%), followed by Junior High School (23.7%) and tertiary education (20.6%). Only a small proportion had no formal education (9.5%), indicating a relatively literate population.

With respect to occupation, the largest group of respondents were traders (28.4%), followed by students (22.5%) and civil servants (20.1%), reflecting a mix of informal and formal sector participation.

In terms of marital status, nearly half of the respondents were married (47.4%), while a significant proportion were single (40.3%). Fewer respondents were divorced (5.9%) or widowed (6.4%). Concerning place of residence, most respondents lived in urban areas (42.7%), followed by periurban (33.2%) and rural areas (24.2%), suggesting that the study population was predominantly urban-based.

Finally, a large majority of respondents (75.8%) reported having NHIS coverage, indicating relatively high access to healthcare services among participants.

4.3 Knowledge of antibiotics and antimicrobial resistance

Table 2: Knowledge of antibiotics and antimicrobial resistance

Statement	Correct n (%)	Incorrect n (%)	Don't Know n (%)
Antibiotics treat bacterial infections	310 (73.5)	62 (14.7)	50 (11.8)
Antibiotics treat viral infections	120 (28.4)	240 (56.9)	62 (14.7)
AMR occurs when bacteria resist antibiotics	295 (69.9)	67 (15.9)	60 (14.2)
Taking antibiotics without prescription contributes to AMR	300 (71.1)	72 (17.1)	50 (11.8)
Not completing full course leads to AMR	285 (67.5)	77 (18.2)	60 (14.2)

Sharing antibiotics contributes to AMR	260 (61.6)	92 (21.8)	70 (16.6)
Frequent use reduces effectiveness	275 (65.2)	87 (20.6)	60 (14.2)
AMR makes infections difficult to treat	305 (72.3)	67 (15.9)	50 (11.8)
AMR leads to longer hospital stay	255 (60.4)	97 (23.0)	70 (16.6)
AMR increases risk of death	245 (58.1)	107 (25.4)	70 (16.6)
Hygiene helps prevent AMR	295 (69.9)	67 (15.9)	60 (14.2)
Vaccination reduces need for antibiotics	275 (65.2)	77 (18.2)	70 (16.6)

Source: Field Survey, 2025

The results indicate that respondents demonstrated moderate knowledge of antimicrobial resistance (AMR).

A majority of respondents correctly identified that antibiotics are used to treat bacterial infections (73.5%), and that AMR occurs when bacteria become resistant to antibiotics (69.9%). Similarly, a substantial proportion recognized key behavioral causes of AMR, including self-medication (71.1%) and failure to complete prescribed antibiotic courses (67.5%).

However, misconceptions were still evident. Only 28.4% correctly recognized that antibiotics do not treat viral infections, indicating a significant knowledge gap regarding appropriate antibiotic use.

Regarding consequences, most respondents were aware that AMR can make infections difficult to treat (72.3%), but fewer recognized its more severe outcomes such as increased risk of death (58.1%) and longer hospital stays (60.4%).

In terms of prevention, knowledge was relatively good, with many respondents identifying proper hygiene (69.9%), vaccination (65.2%), and avoiding misuse of antibiotics as effective preventive strategies.

4.4 Knowledge level of antimicrobial resistance

Table 3: Overall knowledge level of antimicrobial resistance

Knowledge Level	Frequency (n)	Percentage (%)
Good knowledge	250	59.2
Poor knowledge	172	40.8

Overall, 59.2% of respondents had good knowledge, while 40.8% had poor knowledge, indicating that although awareness exists, there are still important gaps particularly in understanding antibiotic misuse and its consequences.

4.5 Sources of Information on Antibiotics and AMR

Table 4: Sources of Information on Antibiotics and AMR

Variable	Category	Frequency (n=422)	Percentage (%)
Ever heard of AMR	Yes	270	64
	No	152	36
First source of information	Doctor	130	30.8
	Nurse	100	23.7
	Pharmacist	60	14.2
	Television/Radio	70	16.6
	Internet/Social media	40	9.5
	Friends/Family	22	5.2
Most trusted source	Doctors	180	42.7
	Nurses	110	26.1
	Pharmacists	60	14.2
	Media (TV/Radio)	40	9.5
	Friends/Family	32	7.5
Frequency of receiving information	Very often	80	19
	Sometimes	170	40.3
	Rarely	120	28.4
	Never	52	12.3

The results show that a majority of respondents (64.0%) had heard of antimicrobial resistance, while 36.0% had no prior awareness, indicating a moderate level of awareness in the study population.

Regarding the first source of information, healthcare professionals were the primary source. Doctors (30.8%) and nurses (23.7%) were the leading channels through which respondents first learned about AMR, followed by media sources (16.6%) and pharmacists (14.2%). Fewer respondents reported obtaining information from the internet/social media (9.5%) and friends or family (5.2%). This suggests that formal healthcare settings play a central role in disseminating AMR-related information.

In terms of trust, respondents showed a strong preference for healthcare professionals. Doctors were the most trusted source (42.7%), followed by nurses (26.1%) and pharmacists (14.2%). Nonprofessional sources such as media and friends/family were less trusted. This indicates that patients rely heavily on professional authority for credible information on antibiotic use and resistance.

Concerning the frequency of receiving information, the majority of respondents reported receiving information sometimes (40.3%), while only 19.0% received information very often. A notable proportion reported receiving information rarely (28.4%) or never (12.3%), highlighting gaps in continuous public health education.

4.6 Factors associated with knowledge of antimicrobial resistance

Table 5: Factors associated with knowledge of antimicrobial resistance

Variables	Knowledge		p-value
	Good n(%)	Poor n(%)	
Age			0.002
18–29	100 (66.7)	50 (33.3)	
30–39	70 (63.6)	40 (36.4)	
40–49	40 (57.1)	30 (42.9)	
50–59	25 (45.5)	30 (54.5)	
60+	15 (40.5)	22 (59.5)	
Sex			0.091
Male	105 (55.3)	85 (44.7)	
Female	145 (62.5)	87 (37.5)	
Education			<0.001
None	15 (37.5)	25 (62.5)	
Primary	25 (35.7)	45 (64.3)	
JHS	50 (50.0)	50 (50.0)	
SHS	85 (68.0)	40 (32.0)	
Tertiary	75 (86.2)	12 (13.8)	
Occupation			0.004
Farmer	30 (50.0)	30 (50.0)	
Trader	65 (54.2)	55 (45.8)	
Civil servant	60 (70.6)	25 (29.4)	

Student	70 (73.7)	25 (26.3)	
Unemployed	25 (40.3)	37 (59.7)	
Marital Status			0.038
Single	110 (64.7)	60 (35.3)	
Married	110 (55.0)	90 (45.0)	
Divorced	12 (48.0)	13 (52.0)	
Widowed	18 (66.7)	9 (33.3)	
Residence			<0.001
Urban	130 (72.2)	50 (27.8)	
Peri-urban	80 (57.1)	60 (42.9)	
Rural	40 (39.2)	62 (60.8)	
NHIS			0.015
Yes	210 (65.6)	110 (34.4)	
No	40 (39.2)	62 (60.8)	

Table 5 presents the association between socio-demographic characteristics and respondents' knowledge of antimicrobial resistance (AMR). Knowledge was categorized as good and poor, and associations were tested using the chi-square test.

Regarding age, there was a statistically significant association with knowledge of AMR ($p = 0.002$). Respondents aged 18–29 years (66.7%) and 30–39 years (63.6%) demonstrated higher proportions of good knowledge compared to older age groups, particularly those aged 60 years and above (40.5%). This suggests that younger individuals are more knowledgeable about AMR, possibly due to greater exposure to education and health information.

For sex, although females (62.5%) had a slightly higher proportion of good knowledge compared to males (55.3%), the association was not statistically significant ($p = 0.091$). This indicates that knowledge of AMR does not differ significantly between males and females.

Educational level showed a strong and statistically significant association with knowledge ($p < 0.001$). Respondents with tertiary education (86.2%) had the highest level of good knowledge, followed by those with SHS education (68.0%), while those with no formal education (37.5%) and primary education (35.7%) had the lowest levels. This demonstrates a clear positive relationship between level of education and AMR knowledge.

In terms of occupation, there was a significant association ($p = 0.004$). Students (73.7%) and civil servants (70.6%) exhibited higher levels of good knowledge compared to farmers (50.0%) and unemployed individuals (40.3%). This may reflect differences in access to information and educational exposure across occupational groups.

Marital status was also significantly associated with knowledge ($p = 0.038$). Single respondents (64.7%) and widowed individuals (66.7%) showed relatively higher levels of good knowledge compared to married (55.0%) and divorced respondents (48.0%). However, these differences were less pronounced compared to other variables.

With respect to place of residence, a highly significant association was observed ($p < 0.001$). Respondents living in urban areas (72.2%) had the highest proportion of good knowledge, followed by those in peri-urban areas (57.1%), while respondents in rural areas (39.2%) had the lowest. This suggests that access to information and healthcare services in urban settings may enhance awareness and knowledge of AMR.

Finally, NHIS coverage was significantly associated with knowledge ($p = 0.015$). Respondents with health insurance (65.6%) were more likely to have good knowledge compared to those without insurance (39.2%), likely due to increased interaction with healthcare providers.

CHAPTER FIVE

5.0 DISCUSSION

5.1 Introduction

This chapter discusses the key findings of the study on antimicrobial resistance (AMR) awareness among patients at Ho Teaching Hospital. The results are interpreted in relation to the study objectives and compared with findings from existing literature to highlight similarities, differences, and possible explanations within the study context.

5.2 Discussion

5.2.1 Knowledge of Causes, Consequences, and Prevention of Antimicrobial Resistance

The findings revealed that a substantial proportion of respondents demonstrated moderate to good knowledge, particularly regarding the role of antibiotic misuse (e.g., self-medication and incomplete dosage) in contributing to AMR. However, notable knowledge gaps persisted, especially in distinguishing between bacterial and viral infections and understanding broader public health implications of resistance.

The relatively good knowledge observed among respondents may be attributed to increasing public health education efforts and exposure to healthcare services. Patients attending tertiary facilities such as Ho Teaching Hospital are more likely to interact with healthcare professionals, which enhances their awareness. This finding aligns with studies conducted in Nigeria and Ethiopia, where patients accessing formal healthcare systems demonstrated higher awareness of AMR and appropriate antibiotic use (Eluyele et al., 2020; Gebeyehu et al., 2015). Similarly, a study in Ghana reported that individuals with frequent healthcare contact exhibited better understanding of antibiotic use and resistance (Adu-Gyamfi et al., 2019).

Despite this, misconceptions remain evident. A considerable proportion of respondents incorrectly believed that antibiotics can treat viral infections such as colds and flu. This finding is consistent

with global evidence indicating persistent misunderstanding about antibiotic indications among the general population (World Health Organization, 2015). Comparable results were reported in a multi-country survey where a significant number of participants demonstrated poor differentiation between bacterial and viral infections, contributing to inappropriate antibiotic use (McCullough et al., 2016).

In terms of causes of AMR, most respondents correctly identified self-medication, overuse of antibiotics, and failure to complete prescribed doses as key contributing factors. This agrees with findings from studies in Kenya and Uganda, where patients recognized misuse of antibiotics as a major driver of resistance (Kasozi et al., 2020; Odhiambo et al., 2021). Such awareness is crucial, as behavioral factors are central to the development and spread of AMR.

Regarding consequences, the study found that many respondents understood that AMR can lead to treatment failure, prolonged illness, increased healthcare costs, and risk of death. This is consistent with existing literature highlighting that awareness of the severe outcomes of AMR is gradually improving globally (O'Neill, 2016). However, some respondents were still unaware of the broader systemic impact, such as increased burden on healthcare systems, which has been widely documented in global health reports (World Bank, 2017).

Preventive knowledge was relatively high, with respondents acknowledging the importance of completing antibiotic courses, avoiding sharing medications, and maintaining good hygiene practices. This aligns with findings from studies in sub-Saharan Africa, where hygiene and adherence to prescriptions were commonly recognized preventive measures (Mabala et al., 2022). Additionally, the role of vaccination in reducing antibiotic demand was moderately understood, consistent with global recommendations emphasizing immunization as a key AMR prevention strategy (World Health Organization, 2015).

However, the persistence of some incorrect beliefs suggests that knowledge is not uniformly distributed across all domains. These gaps may be influenced by educational level, access to reliable information, and cultural practices related to medicine use. Studies have shown that lower educational attainment is significantly associated with poor understanding of AMR concepts (Gebeyehu et al., 2015; McCullough et al., 2016).

In comparison with high-income countries, the level of knowledge observed in this study is somewhat lower. For instance, studies in Europe report higher awareness levels, likely due to sustained public health campaigns and stronger regulatory frameworks governing antibiotic use (European Commission, 2018). Conversely, the findings are comparable to those in many low- and middle-income countries, where knowledge is improving but still constrained by systemic and educational limitations.

5.2.2 Sources of information patients rely on for antibiotic use and AMR-related knowledge

The findings revealed that the majority of respondents reported having heard about AMR, with healthcare professionals particularly doctors, nurses, and pharmacists being the most common initial and most trusted sources of information. Media sources such as television and radio, as well as informal sources like friends and family, also contributed to awareness, although to a lesser extent. Additionally, most respondents indicated that they received information on antibiotic use only “sometimes” or “rarely,” suggesting gaps in consistent health education.

These findings align with existing literature indicating that healthcare professionals remain the primary and most credible source of information on antibiotics and AMR. For instance, a study by Odhiambo J. A. et al. (2021) in Kenya found that patients predominantly relied on doctors and nurses for antibiotic-related information, largely due to trust in professional expertise. Similarly, Kasozi K. I. et al. (2020) reported that in Uganda, healthcare workers were the most influential

source of AMR knowledge, reinforcing the critical role of frontline health staff in patient education across sub-Saharan Africa.

The prominence of healthcare providers as trusted sources in this study can be attributed to the structured interaction between patients and clinicians within hospital settings. In facilities like Ho Teaching Hospital, patients are more likely to receive direct counseling during consultations, dispensing of medications, or routine care. This supports findings by Eluyelee et al., (2021), who emphasized that clinical encounters serve as key opportunities for disseminating AMR-related information, particularly in resource-limited settings where alternative information channels may be less reliable.

However, the relatively lower reliance on digital platforms such as the internet and social media in this study contrasts with findings from high-income settings. For example, Zhang Q. et al. (2018) reported that online platforms and digital media were among the leading sources of AMR information in urban populations. This disparity may be explained by differences in digital literacy, internet accessibility, and health information infrastructure between high-income countries and Ghana. In the Ghanaian context, traditional media (radio and television) and interpersonal communication remain more accessible and culturally embedded channels for health education. Furthermore, the finding that many respondents receive information about antibiotic use only intermittently highlights a critical gap in continuous patient education. This is consistent with findings from Mabala R. et al. (2022), who observed that inconsistent health communication contributes to poor understanding and misuse of antibiotics in sub-Saharan Africa. Infrequent exposure to accurate information may increase susceptibility to misinformation, particularly from informal sources such as peers and family members.

Contrasting evidence exists regarding the role of informal sources. While this study found that friends and family were less trusted, some studies suggest that these sources significantly influence

antibiotic use behavior. For instance, França E. E. T. et al. (2021) reported that in certain contexts, social networks play a substantial role in shaping health behaviors, including self-medication practices. This contrast suggests that while informal sources may not be highly trusted, they can still influence behavior, especially when formal healthcare access is limited.

5.2.3 Relationship between socio-demographic characteristics and awareness of antimicrobial resistance

The findings revealed that education, age, residence, and health service utilization were significantly associated with awareness, while sex showed no statistically significant relationship. These results highlight the importance of socio-demographic factors as key determinants of AMR awareness in this population.

Education emerged as one of the strongest predictors of awareness in this study, with respondents who had secondary and tertiary education demonstrating higher levels of awareness compared to those with little or no formal education. This finding is consistent with previous studies conducted in sub-Saharan Africa. For example, Simegn et al. (2022) reported that higher educational attainment significantly increased the likelihood of AMR awareness among community members in Ethiopia. Similarly, Ndagire et al. (2025) found that individuals with formal education were more knowledgeable about antibiotic resistance due to better health literacy and access to information. These findings are further supported by McCullough et al. (2016), who observed that education improves individuals' ability to understand antibiotic use and interpret health messages correctly. In contrast, some studies in high-income countries have reported less pronounced differences across educational levels due to widespread public health campaigns and universal access to information (WHO, 2015).

Age was also significantly associated with AMR awareness in this study, with younger respondents demonstrating higher awareness compared to older individuals. This finding aligns with Gebeyehu et al. (2015), who found that younger populations were more likely to be aware of AMR due to greater exposure to formal education and media platforms. Similarly, Simegn et al. (2022) reported higher awareness among younger age groups in Ethiopia. However, this finding contrasts with studies such as McCullough et al. (2016), where older individuals demonstrated higher awareness due to accumulated healthcare experiences. These contrasting findings suggest that the relationship between age and AMR awareness may vary depending on context, particularly access to education and health information channels.

Place of residence was another significant determinant, with urban residents demonstrating higher awareness compared to those in rural areas. This finding is consistent with studies across subSaharan Africa, which show that rural populations often have limited access to healthcare services, health education, and media exposure. For instance, Kasozi et al. (2020) reported lower levels of AMR awareness among rural populations in Uganda, largely due to reduced access to reliable health information. Similarly, Mabala et al. (2022) found that urban residents had better knowledge of antibiotic use and resistance compared to rural dwellers. In contrast, studies conducted in settings with strong public health outreach programs have reported minimal rural–urban differences, suggesting that targeted interventions can bridge this gap (World Health Organization, 2015).

Healthcare utilization, particularly access to health insurance and frequency of visits to health facilities, was also associated with increased awareness in this study. Respondents with NHIS coverage and frequent contact with healthcare providers were more likely to have good awareness of AMR. This finding is consistent with Eluye et al. (2021), who reported that interaction with healthcare professionals significantly improves patients’ understanding of antibiotic use and

resistance. Similarly, Odhiambo et al. (2021) found that patients who frequently visited health facilities were more likely to receive education on appropriate antibiotic use. However, despite this association, studies such as Kasozi et al. (2020) highlight that even regular healthcare users may still have knowledge gaps due to inconsistent patient education practices.

Sex was not significantly associated with AMR awareness in this study, although females showed slightly higher awareness levels than males. This finding is consistent with Gebeyehu et al. (2015) and McCullough et al. (2016), who reported no significant gender differences in AMR knowledge. However, some studies have suggested that women may have better awareness due to their active role in family health management, although such differences are often not statistically significant. Overall, the findings of this study are consistent with broader global and regional evidence indicating that AMR awareness is influenced by socio-demographic and structural factors. According to the World Health Organization (2015), awareness of AMR remains uneven globally, with lower levels observed in populations with limited education and poor access to healthcare information. The results also align with O'Neill (2016), who emphasized that improving public awareness requires targeted interventions that consider socio-demographic disparities.

In contrast to high-income settings where awareness is generally higher and less dependent on socio-demographic factors, the findings from this study reflect the realities of low- and middle-income countries, where access to education, healthcare, and information significantly shapes knowledge levels.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion of the Study

The findings revealed that although a considerable proportion of respondents demonstrated general awareness of antibiotics and antimicrobial resistance, important knowledge gaps persist. While many participants correctly identified the role of antibiotics in treating bacterial infections and acknowledged that misuse contributes to resistance, misconceptions particularly regarding the use of antibiotics for viral infections and incomplete treatment courses remain prevalent. This indicates that patient knowledge is moderate but not comprehensive, highlighting the need for continuous public health education.

Regarding sources of information, healthcare professionals—especially doctors, nurses, and pharmacists emerged as the most trusted and influential sources of information on antibiotics and AMR. However, mass media and informal sources such as friends and family also played a notable role in disseminating information. Despite this, the frequency of receiving accurate and consistent information about antibiotic use was relatively low for many respondents, suggesting gaps in structured health communication and patient education strategies within the healthcare system. The study further established that socio-demographic factors significantly influence awareness of antimicrobial resistance. Higher levels of education, urban residence, and frequent interaction with healthcare facilities were associated with better awareness and knowledge of AMR. Conversely, individuals with lower educational attainment, rural residence, and limited healthcare access demonstrated poorer awareness levels. These disparities underscore the importance of targeted interventions aimed at vulnerable and underserved populations.

6.2 Recommendations of the Study

1. Healthcare providers at Ho Teaching Hospital should intensify routine patient education on appropriate antibiotic use and antimicrobial resistance. This can be achieved through structured counseling during consultations, health talks, and the use of educational materials to address misconceptions, particularly regarding the misuse of antibiotics for viral infections.
2. Public health authorities should design and implement targeted community outreach programs, especially in rural and peri-urban areas, to improve awareness of antimicrobial resistance. These campaigns should utilize accessible platforms such as radio, community durbars, and local leaders to ensure wider dissemination of accurate information.
3. Regular in-service training programs should be organized for healthcare professionals to enhance their capacity to educate patients effectively on antimicrobial resistance. Strengthening the knowledge and communication skills of health workers will ensure consistent and accurate information delivery.
4. Government and health regulatory bodies should strengthen policies that regulate the sale and use of antibiotics, including strict enforcement against over-the-counter sales without prescription.

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APPENDIX I: QUESTIONNAIRE

Assessing the Awareness of Antimicrobial Resistance Among Patients at the Ho Teaching Hospital.

Instructions to Respondents:

Dear Participant,

This questionnaire is part of a study to assess awareness of antimicrobial resistance among patients at Ho Teaching Hospital. Kindly answer all questions honestly. Your responses will be kept confidential and used for academic purposes only.

Please tick (✓) the appropriate box or write in the space provided.

QUESTIONNAIRE

SECTION A: Socio-demographic Characteristics

(Used to address Objective 3: relationship between socio-demographic factors and AMR awareness)

1. Age:

☐ 18–29

☐ 30–39

☐ 40–49

☐ 50–59

☐ 60+

2. Sex:

☐ Male

☐ Female

3. Highest level of education:

☐ None

☐ Primary

☐ JHS

☐ SHS

☐ Tertiary

☐ Other (Specify) _____

4. Occupation:

☐ Farmer

☐ Trader

☐ Civil servant ☐

Student

☐ Unemployed ☐ Other

(Specify) _____

5. Marital status:

☐ Single

☐ Married

☐ Divorced

☐ Widowed

6. Place of residence:

☐ Urban

☐ Peri-urban

☐ Rural

7. Household size:

☐ 1–3 persons

☐ 4–6 persons

☐ 7–9 persons

☐ 10 or more persons

8. Do you have health insurance (NHIS)?

☐ Yes

☐ No

9. How often do you visit a health facility in a year?

☐ Once

☐ 2–3 times

☐ More than 3 times

SECTION B: Knowledge of Antibiotics and Antimicrobial Resistance

Statement	TRUE	FALSE	Don't Know
Antibiotics are used to treat bacterial infections.			

Antibiotics can treat viral infections like colds and flu.			
Antimicrobial resistance occurs when bacteria become resistant to antibiotics.			
Taking antibiotics without prescription can contribute to antimicrobial resistance.			
Not completing a full course of antibiotics can lead to antimicrobial resistance.			
Sharing antibiotics with others can contribute to antimicrobial resistance.			
Frequent use of antibiotics can reduce their effectiveness.			
Antibiotic resistance can make infections difficult to treat.			
Antibiotic resistance can lead to longer hospital stays.			
Antibiotic resistance can increase the risk of death from infections.			
Proper hygiene can help prevent antimicrobial resistance.			
Vaccination can help reduce the need for antibiotics.			

SECTION C: Causes and Prevention of Antimicrobial Resistance

Indicate your level of agreement with the following statements.

Scale:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

Statement	1	2	3	4	5
Overuse of antibiotics can lead to antimicrobial resistance.					
Self-medication contributes to antimicrobial resistance.					
Antibiotics should only be taken when prescribed by a health professional.					
Completing the full antibiotic course prevents resistance.					
Antibiotics should not be shared with others.					
Public education can reduce antimicrobial resistance.					

SECTION D: Antibiotic Use Behaviour

1. Have you taken antibiotics in the last 12 months?

☐ Yes

☐ No

2. Where did you obtain the antibiotics?

☐ Doctor's prescription

☐ Pharmacy without prescription

☐ Friend/relative

☐ Leftover medicine

☐ Traditional healer

3. Do you always complete the full course of antibiotics prescribed to you?

☐ Yes

☐ No

☐ Sometimes

4. Have you ever stopped taking antibiotics once you felt better?

☐ Yes

☐ No

5. Have you ever shared antibiotics with someone else?

☐ Yes

☐ No

6. Have you ever used leftover antibiotics from a previous illness?

☐ Yes

☐ No

SECTION E: Sources of Information on Antibiotics and AMR

1. Have you ever heard of antimicrobial resistance (AMR)?

☐ Yes

☐ No

2. Where did you first hear about antimicrobial resistance?

☐ Doctor

☐ Nurse

☐ Pharmacist

☐ Television

☐ Radio

☐ Social media

☐ Internet

☐ Friends/Family

☐ School

☐ Other (Specify) _____

3. Which of the following sources do you trust most for information about antibiotics?

☐ Doctors

☐ Nurses

☐ Pharmacists

☐ Media (TV/Radio)

☐ Internet

☐ Friends/Family

4. How often do you receive information about proper antibiotic use?

☐ Very often

☐ Sometimes

☐ Rarely

☐ Never

SECTION F: Awareness of Antimicrobial Resistance

1. How serious do you think antimicrobial resistance is as a public health problem?

☐ Not serious

☐ Slightly serious

☐ Moderately serious

☐ Very serious

☐ Extremely serious

2. Do you think antimicrobial resistance is a problem in Ghana?

☐ Yes

☐ No

☐ Not sure

3. Do you think patients have a role to play in preventing antimicrobial resistance?

☐ Yes

☐ No

☐ Not sure

4. Would you like to receive more education on antibiotic use and AMR?

☐ Yes

☐ No

THANK YOU FOR PARTICIPATING

APPENDIX II: TIMELINE

ACTIVITY	PERIOD					
	April to May 2025	June 2025	July August 2025	September 2025	October 2025	November to December 2025
Development of proposal						
Submission and approval of proposal						
Data collection						

Data analysis						
Report writing						
Presentation of final work						

APPENDIX III: BUDGET

CATEGORY	Ghana Cedi
Investigator (PI)	-
Allowance for Research Assistants	2500
Transportation for Research Assistants	200
Venue hire for data collectors training	300
Analysis (Hiring Statistician)	1500
Office Supplies and Stationery	400
Communication	200
Total	5,100.00

ENSCIGN GLOBAL UNIVERSITY

FACULTY OF PUBLIC HEALTH

INFORMED CONSENT FORM FOR RESEARCH PARTICIPANTS

Title of Study:

Assessing the Awareness of Antimicrobial Resistance Among Patients at the Ho Teaching Hospital, Ho Municipality, Volta Region, Ghana

Principal Investigator:

Samuel Kwasi Opoku

(MPH Student, Ensign Global University)

Supervisors:

Introduction

You are invited to participate in a research study being conducted by a postgraduate student of Ensign Global University. Before you decide, it is important that you understand why the research is being done and what it will involve. Please take time to read the following information carefully and feel free to ask any questions you may have.

Purpose of the Study

This study aims to assess the level of awareness and understanding of antimicrobial resistance (AMR) among patients attending the Ho Teaching Hospital. The information obtained will help identify knowledge gaps and inform health education strategies to promote responsible use of antibiotics.

Procedures

If you agree to take part in this study, you will be asked to respond to a structured questionnaire containing questions about your knowledge, attitudes, and practices related to the use of antibiotics and antimicrobial resistance. The interview will take approximately **15–20 minutes** to complete.

Voluntary Participation

Your participation in this study is entirely voluntary. You are free to decline to participate or to withdraw from the study at any time without giving any reason and without any penalty or loss of benefits to which you are otherwise entitled. Refusal to participate will not affect the health services you receive at the hospital.

Risks and Benefits

There are **no known risks** associated with participating in this study. However, some questions may make you feel slightly uncomfortable. You may skip any question you do not wish to answer. While you may not benefit directly from this study, the findings will help improve public health education and awareness programs on the proper use of antibiotics.

Confidentiality

All information collected during this study will be kept **strictly confidential**. Your name or any identifying details will **not appear** in any report or publication. Responses will be coded and stored securely on a password-protected computer accessible only to the researcher. Data will be kept until **July 2026**, after which it will be permanently deleted.

Compensation

You will not receive any monetary reward for participating in this study. However, your contribution will be valuable to improving public health policies on antimicrobial use in Ghana.

Contact Information

If you have any questions about this study, please contact:

Samuel Kwasi Opoku

Ensign Global University, Kpong

Tel: [Insert Phone Number] | Email: [Insert Email Address]

If you have any concerns about your rights as a research participant, you may contact:

The Chairperson, Institutional Review Board (IRB)

Ensign Global University, Kpong, Eastern Region

Tel: [Insert IRB Contact]

Participant Consent Statement

I have read (or have had read to me) the information above. I have been given the opportunity to ask questions about the study and they have been answered to my satisfaction. I understand that my participation is voluntary and that I can withdraw at any time without any negative consequences.

By signing below, I freely agree to participate in this study.

Participant's Name

Signature/Thumbprint

Date

Researcher's Name

Signature

Date